



Peat Marwick Stevenson & Kellogg
Management Consultants

In collaboration with:



Clement W. Bowman Consulting Inc.
Technology Consultants

MEASURING GOOD RESEARCH MANAGEMENT

A VERSATILE QUANTITATIVE APPROACH

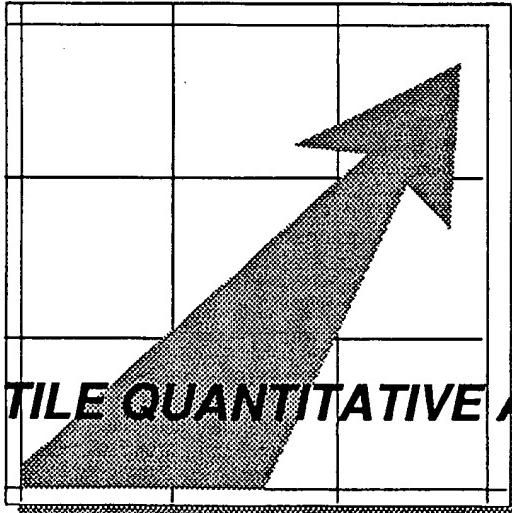


EXHIBIT B

Are you managing your research and development resources effectively?

Today, and for the foreseeable future, research laboratories can no longer be viewed as ivory towers, isolated from the business climate around them. Academic laboratories, government research organizations and corporate research departments are scrutinizing all research activity to ensure that they link to overall business strategies.

Novel business arrangements and structures, strategic alliances and partnerships, research consortia and networks, and the creation of cross functional teams have emerged as responses to increasingly complex technical and business challenges within limited resources and an ever-expanding global arena. Management of research has been driven to evolve within this dynamic environment.

Research and development investment in Canada exceeds \$8 billion on an annual basis. Although Canadian industry and governments recognize the

critical contribution of research activity to our future prosperity, it is unlikely that R&D expenditures will rise in the foreseeable future. In response, attention has focused on improving the efficiency and effectiveness of Canadian R&D, with investors seeking demonstration that funds are being managed wisely.

Most research managers begin their careers as practising scientists or engineers and gradually assume management responsibilities over an extended period of time. How should they measure their progress? Feedback from their superiors, and even more importantly, feedback from paying clients, will always be a major guide to management effectiveness. However, managers often find it difficult to translate this information into concrete actions for improvement.

Many managers responsible for a portfolio of research programs or research laboratories are removed from day-to-day management. How should they measure the effectiveness of the management efforts of these research units? While periodic technical audits using a variety of input and output parameters provide useful indicators of effectiveness, they do not provide specific direction for improvement or "arenas for action".

Two broad classes of research organization

The Continuous Improver	The Big Transformer
<p>Our business determines our technology.</p> <p>Meeting the needs of today's clients.</p> <p>Ability to respond in real time.</p> <p>Skilled in technology adaptation.</p> <p>A quality supplier of processes, products and services.</p> <p>Doing things right.</p>	<p>Our technology determines our business.</p> <p>Identifying tomorrow's clients.</p> <p>Protecting the long term future.</p> <p>Skilled in technology development.</p> <p>An innovative supplier of processes, products and services.</p> <p>Doing the right things.</p>



We have developed an R&D Management Grid to provide a quick answer

We have observed two broad classes of research organization—those focused on success through continuous improvement in meeting short and near term goals and those striving to make major transformations over the long term. The correct positioning with respect to these two broad classes will be derived from the overall technological mission of the parent or client organization. Organizations dedicated

to incremental improvements to extend the life of a mature product or to enhance the capabilities of an existing process will tend to emphasize practices associated with continuous improvement.

Organizations undertaking leading edge research to develop new science, new products or new innovative processes will be searching for major transformations, which could be the foundations for new future business.

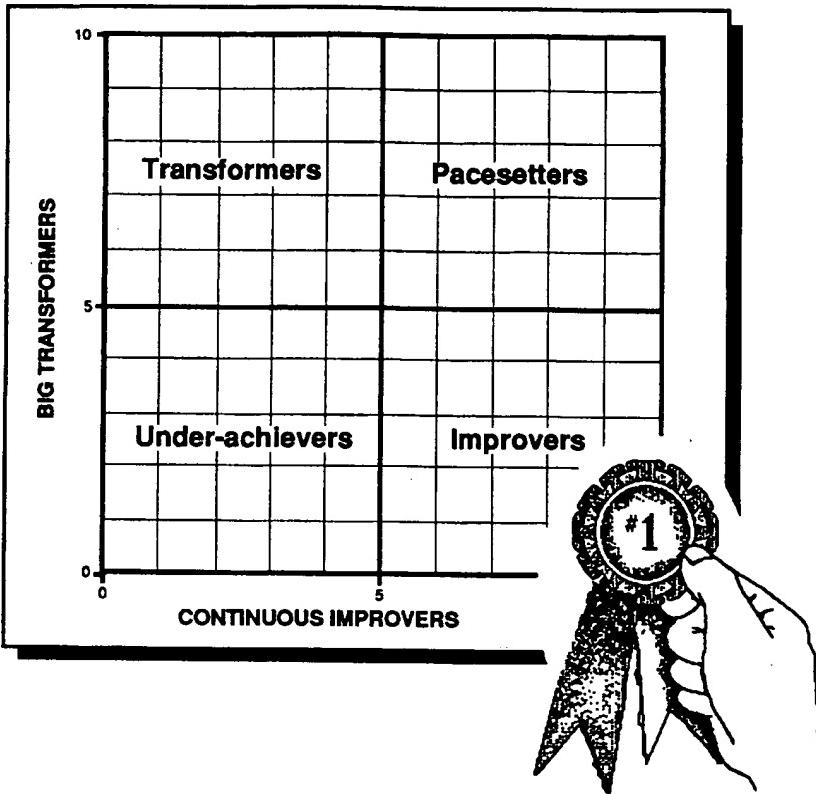
While elements of both classes often can be found in all research organizations, there is often a dominant tendency which leads to predictable characteristics, illustrated in the table above.

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Dr. Clement W. Bowman, in association with Peat Marwick Stevenson & Kellogg, has developed a systematic and efficient approach to determine how actual management practices align themselves with one or some mix of these classes.

Application of the tool will generate two key reports—a research management positioning grid and a best practices matrix providing a comparative indication of strengths in various management areas.

Research Management Positioning Grid



Research Management Positioning Grid

The research management positioning grid uses a scoring system for a number of research attributes to generate a position within a grid, as follows:

The bottom axis measures the commitment to continuous improvement to meet the needs of today's clients and to near term business success. The side axis measures the commitment to major transformation and the longer term business success of both current and future clients. The four quadrants represent organizations with different mixes of short and long term priorities:

- An "Under-achiever" represents an organization deficient in the delivery of both short and long term expectations of stakeholders.
- An "Improver" represents an organization that meets short term stakeholder requirements. If

the position is close to the bottom axis, the organization has essentially no commitment to seeking out new business opportunities or increasing its intellectual capacity.

- A "Transformer" represents an organization that has made advances in technology of longer term importance to owners and principal clients. Typically, such an organization has made major technological advances which will affect the future course of science, some of which will be the foundation for new business opportunities. If the position is close to the side axis, the organization is isolated from the current needs of its stakeholders.
- A "Pacesetter" represents an organization that has been able to develop an effective portfolio of both short and long term programs which provide mutual sustenance.

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Best Practice Clusters

	Inside the Research Organization	Inside the Corporation or Key Clients	External to the Corporation or Key Clients
Setting the Stage	Vision and Mission	Technology and the Corporate Plan	National & International Technology Linkages
Implementing Intentions	Program Management	Corporate Cross Links	Linkage to Science and Education
Ensuring Sustainability	Core Competencies & the Technical Ladder	Continuity of Support	Linkage to Community Leaders
	Training and Professional Development		

Best Practices Matrix

Attributes cluster into ten 'best practice' areas as shown in the above chart.

Each of these practice areas is focused upon either the R&D unit, the corporation or external communities. Certain practices set the stage for further success; creation of an inspiring vision and

mission; getting technology into the corporate plan; establishing national and international technology linkages. Other practices contribute to implementing the intentions expressed in plans or ensuring sustainability of the organization. Analysis of the ratings displayed in the Best Practice Matrix allows a research manager or senior decision-maker to formulate an agenda for change.



This versatile tool can help different R&D stakeholders

Our approach is participative and tailored to your specific requirements. The tool can be applied by a number of different stakeholders in a research organization. Each application is tailored through selection of the most appropriate respondent groups. We will involve any of the following stakeholder groups in data gathering, depending upon the requirements and the user:

- Principal owners.
- Boards of Directors or Advisors.
- Senior management
- Middle management.
- Professional and/or technical staff.
- Major clients.
- Other clients.
- Sister organizations.
- Associated research and/or academic organizations.
- Other suppliers or beneficiaries.

Users have gained valuable insights through creative application of both the Research Management Positioning Grid and the Best Practice Matrix.

A. Research manager

Research managers assessing the management strength of their organization will use the tools to:

- ▶ Determine the alignment of current management practices against the envisioned future state of the research organization.
- ▶ Create management improvement programs focused upon deficiencies in capabilities.
- ▶ Re-position research operations to more closely reflect strategic and technological missions.
- ▶ Identify inconsistencies in the expectations of clients, partners, owners and staff.

B. Principal owner

Reviews of the research and development function will be improved through application of the tool to:

- ▶ Assess management capabilities over time.
- ▶ Determine consistency of research focus with overall strategies and technological missions of the parent organization.

- ▶ Ensure alignment of expectations between the research organization and the parent organization.

C. Manager of a portfolio of research establishments

Senior executives with responsibility for a number of research establishments in several locations will benefit by using the tool to:

- ▶ Compare research organizations within their portfolio.
- ▶ Identify research units with 'best practices' to serve as benchmarks for other research managers.
- ▶ Test the extent to which corporate expectations have been transferred to research units.

D. Funder of research organizations

Many government and venture capital managers responsible for dispensing research funding will apply the tool to:

- ▶ Assess the consistency of research organization applicants with funding purposes.
- ▶ Evaluate the management capabilities of potential recipients to reduce financial risk.



Gathering source data is relatively painless

Central to our methodology is computer-aided survey analysis. Data are gathered in the same manner in all cases.

- ▶ All respondents are asked to rate the organization using a series of descriptive statements which define either a Continuous Improver or a Big Transformer.
- ▶ Respondents most familiar with the management of the research

organization are asked to rate the organization using over ninety "Best Practices" considered appropriate in varying degrees for the two classes of research organizations.

In addition to assessing the current position of the organization, respondents may also be requested to provide projections on future expectations. Periodic reassessments will permit a measurement of the degree to which the organization has shifted to meet the idealized future state.

About Clement W. Bowman Consulting Inc.

CWB Consulting provides a wide range of technology consulting services for both public and private sector R&D organizations and their principal owners and clients:

- ▶ Strategic technology plans.
- ▶ Benefit to cost analyses.
- ▶ Organizational performance reviews.
- ▶ Project appraisals.
- ▶ Portfolio analyses.
- ▶ Scale-up and commercialization plans.
- ▶ Intellectual property management.
- ▶ Technology agreements.

Dr. C.W. Bowman, principal of the firm, has had extensive experience in the technology management field, serving as Research manager and Vice-President for Esso Petroleum Canada, Founding Chairman of the Alberta Oil Sands Technology and Research Authority and President of the Alberta Research Council. He maintains an active network with key technology leaders in Canada.



Contact:

Jac van Beek

C.W. (Clem) Bowman

About Peat Marwick Stevenson & Kellogg

KPMG Peat Marwick Stevenson & Kellogg provides a comprehensive range of management consulting services for the science and technology community:

- ▶ Strategic and business planning.
- ▶ Marketing and market research.
- ▶ Program evaluation and review.
- ▶ Business process re-engineering.
- ▶ Tax and regulatory compliance.
- ▶ Financing.
- ▶ Mergers, acquisitions and divestitures.
- ▶ Strategic alliances.
- ▶ Systems and reporting.
- ▶ Human resource management.
- ▶ Career consultancy.
- ▶ Management of quality.
- ▶ Policy and administration.
- ▶ Communications.

KPMG Peat Marwick Stevenson & Kellogg is an employee-owned, Canadian firm of management consultants. We provide a comprehensive range of services to corporate, not-for-profit and government organizations. Our long record of dedicated service to clients has built the firm into a nationwide network of offices with some 300 professionals in various specialties. Our services are always close at hand, through 21 Peat Marwick Stevenson & Kellogg offices across Canada.



Tel: 613-787-3666
Fax: 613-238-3698

Tel: 519-869-6745
Fax: 519 869 6800